

REMARKS

Claims 3-16, 20-23 and 26-29 were addressed in the office action. Claims 14-16, 20-23 and 26-29 have been withdrawn from consideration as nonelected claims. Claims 3-12 stand rejected. (The inclusion in the subject office action of claim 13 among the rejected claims is taken to be inadvertent, as claim 13 is a non-elected claim. Claim 13 is therefore treated herein as having been withdrawn from consideration).

A. Request for Reconsideration of Restriction Requirement

In the subject office action, the Examiner has maintained the restriction requirement and made it final on the grounds that “[I]nvention I (claims 3-12) and III (claims 21-23 and 26-28) are distinct because the process (III) can be used to make a detonating cord with a granular core whereas the detonating cord of claim 3 requires a solid core.” The stated rationale, however, is based on a misunderstanding of the claims. The core of the detonating cord of claim 3 expressly comprises a pulverulent explosive and the method of claim 21 address the use of a pulverulent explosive; such an explosive is inherently solid (as opposed to being liquid; liquids cannot be pulverulent) as recited in claim 3. Therefore, the requirement in claim 3 for a solid core does not provide a distinction from claim 21 adequate to sustain the asserted grounds for restriction. Reconsideration of the restriction requirement and re-instatement of the withdrawn claims is therefore respectfully requested. Since the product (invention I) is not patentably distinct from the claimed method of making it (invention III), the method of use (invention II) must be joined as well. See 37 CFR 1.141(b); MPEP 806.05(i).

B. Preliminary Remarks – Reply to Response to Arguments

The pending claims stand rejected under 35 U.S.C. §103 over U.S. Patent 3,789,759 to Jones (the Jones reference) in view of several secondary references. The Jones reference discloses detonating cord but lacks a disclosure of microballoon diluent in the explosive material therein. The secondary references show the use of microballoons in several products different from detonating cord: in a solid cast explosive booster (U.S. Patent 5,880,399 to Hales et al.), in a slurry explosive and other explosive devices (U.S. Patent 4,547,234 to Takeuchi et al.) and in the deflagrating (non-explosive) material in an igniter (U.S. Patent 3,683,811 to Driscoll).

The stated grounds of rejection and the Examiner's "Response to Arguments" suggest that the Examiner has overlooked salient portions of the Applicants' disclosure and of the secondary references which, when properly considered, show that the Applicants have demonstrated the results they allege to have obtained and that those results run contrary to expectations in the art. In addition, the applied references teach away from the combinations proposed by the Examiner and/or are not properly combinable. These points are discussed more fully in the following sections of this response.

The Examiner also states that the claims are inadequate to overcome the cited references because "it seems clear that the results would not occur with any amount of the diluent and since no amounts are claimed in the independent claim, it is not clear how these alleged unexpected results could occur." On this point, the Examiner is reminded that the claims recite the desired effect of the diluent; the Applicants are not obliged to include an exact numerical quantity. See Andrew Corp. v. Gabriel Electronics, 6 USPQ2d 2010 (Fed. Cir.1988) (overturning Brown Bridge et al. v. Sales Affiliates, 700 F.2d 759, 217 USPQ2d 651 (1st Cir.1983)) ("A claim is not fatally defective for failing to specifically delineate the point at which the change in physical phenomenon occurs." Andrew Corp. at 2014.)

C. Rejection of Claims 8 and 9 Under 35 U.S.C. §112

Claims 8 and 9 have been amended to address the ground of rejection set forth under §112. Support for a diluent comprising a combination of microballoons and an explosive material is found in the specification at paragraph [0050].

D. Rejection of Claims 3, 5, 8 and 10-12 Under 35 U.S.C. §103

Claims 3, 5, 8 and 10-12 stand rejected under 35 U.S.C. §103 as being obvious over U.S. Patent 3,789,759 to Jones (the Jones reference) in view of U.S. Patent 5,880,399 to Hales et al (the Hales reference). The Jones reference discloses a detonating cord comprising an explosive core that may include various non-explosive diluents and inerts, but fails to disclose microballoons as a diluent.

The Applicants have disclosed the use of microballoons in the explosive core of a detonating cord and the result of such use: microballoons diminish the velocity of the detonation signal in

cord. Explicit evidence of this result is provided in Table 1 of paragraph [0052], which shows a significant reduction in velocity of detonation resulting from the inclusion of microballoons in the core of the detonating cord. The Examiner alleges that this result is shown in the Hales reference, citing disclosures therein addressing the effect of microballoons on detonation and impact sensitivities, run-up distance and critical diameter in a cast booster. However, none of these characteristics are detonation velocities. Furthermore, the Hales reference discloses at column 4, lines 55-58 that microballoons *increase* detonation velocity in the booster charge. *This is the opposite of what the Applicants disclose they found when microballoons are used in detonating cord.* Therefore, the Applicants have clearly demonstrated unexpected results that overcome a prima facie obviousness-type rejection based on the combined disclosures of Hales reference and the Jones reference. Accordingly, the stated ground of rejection is respectfully traversed.

In addition to the foregoing, the Applicants respectfully maintain that the Jones reference and the Hales reference cannot properly be combined to support a rejection under 35 U.S.C. 103 because Hales reference shows the use of microballoons in a solid cast booster, whereas the Jones reference discloses a detonating cord, and it is known in the art that the explosive charge of a detonating cord have significantly different properties and are designed to perform different functions from those of cast boosters. Such differences are due, in part, to the fact that cast boosters are generally rigid monolithic products, whereas core of the detonating cord of the Jones reference would be understood to be flexible, with the explosive material therein in the form of powder (see column 6, lines 26-33 and 51-54). Since the form of an explosive material is known to affect its detonation characteristics, it would not be obvious that microballoons would function in detonating cord of the Jones reference in the same way they function in a cast booster (the Hales reference). Therefore, there seems to be no basis in the art for combining the cited teachings of the Hales reference and the Jones reference, and the suggestion to do so appears to be the result of improper hindsight reasoning.

E. Rejections of Claims 4, 6, and 7 Under 35 U.S.C. §103

Claims 4, 6, and 7 stand rejected under 35 U.S.C. §103 as being unpatentable over the Jones reference in view of the Hales reference and further in view of U.S. Patent 4,547,234 to

Takeuchi et al. The Takeuchi reference is cited for disclosing the phenolic resin microspheres or microballoons of the claimed size.

The identified claims are all patentable at least because they depend from a base claim that is patentable for reasons set forth above.

Further, the Takeuchi reference discloses that the specifically sized microballoons give an explosive a low detonation temperature over a long storage period (see column 3, lines 5-15), thus indicating enhanced sensitivity, and states that the same result would be obtained in cast explosives (column 4, lines 49-53). Further, The Takeuchi reference teaches away from lowering the sensitivity of the explosive material (see column 4, lines 20-37). However, the Hales reference states a preference for reducing, rather than enhancing, the sensitivity of a cast booster (see column 2, lines 5-10). The references therefore provide no motive for the proposed combination and in fact teach away from it. Claims 4, 6 and 7 should therefore be viewed as presenting an additional basis of patentability independent of the patentability of claim 3.

In addition, portions of the Takeuchi reference not cited by the Examiner, but which cannot properly be ignored, make the stated ground of rejection improper. The Takeuchi reference teaches away from using amounts of microballoons that would diminish the detonation velocity in the explosive charge (see column 4, lines 38-48), thus teaching away from the claimed invention.

For the foregoing reasons, the stated ground of rejection is respectfully traversed.

F. Rejections of Claim 9 Under 35 U.S.C. §103

Claim 9 stands rejected under 35 U.S.C. §103 as being obvious on three different grounds: (i) over the Jones reference in view of the Hales reference (parts 9 and 10 of the office action) and, (ii) over the Jones reference, U.S. Patent 3,683,811 to Driscoll (the “Driscoll reference”) and further in view of the U.S. Patent 3,367,266 to Griffith (part 13 of the office action).

Claim 9 is allowable at least because it depends from a base claim that is allowable for reasons set forth herein.

G. Rejection of Claims 3, 5, 8, and 10-12 Under 35 U.S.C. §103

The captioned claims stand rejected under 35 U.S.C. §103 as being unpatentable over the Jones reference in view of the Driscoll reference.

The basis of the rejection, as stated in the “Response to Arguments,” is that the Driscoll reference “clearly teaches the use of microballoons to decrease the burn rate, which makes the composition less sensitive....” and that Driscoll reference discloses results “that are exactly what the Applicant is claiming is unexpected.”

The Applicants respectfully submit that the art provides no motive for combining the Driscoll reference with the Jones reference because the Driscoll reference discloses the use of microballoons to slow a burning reaction, whereas the detonating cord of the Jones reference detonates, it does not burn. The evidence submitted by the Applicants with the response dated May 19, 2004 (the pages from Explosives, 2d Ed., by Rudolf Meyer (Verlag Chemie 1981)) shows that the art recognizes a clear distinction between burning (deflagration) reactions and detonation reactions. Therefore, those in the art would not assume that all measures effective for slowing of a burning reaction would also slow the rate of a detonation signal, and so they would not equate the results disclosed by the Driscoll reference with those discovered by the Applicants.

To reliably incorporate the teaching of the Driscoll reference concerning the use of microballoons with the Jones reference, the explosive core of the detonating cord of the Jones reference would have to be replaced with deflagrating material, and it would no longer detonate. Since an obviousness rejection cannot be based on an asserted combination that requires a change in the mode of operation of one of the references (see MPEP 2143.01), the asserted combination lacks a proper basis in law. Accordingly, the stated ground of rejection is respectfully traversed.

In addition, the art provides no motive for adding the microballoons of the Driscoll reference to the explosive core of the detonating cord of the Jones reference, because the benefit provided by microballoons in the Driscoll reference, slowing the burn rate of an ignition material, has no relevance to the Jones reference: the Driscoll reference was concerned with the electrical continuity characteristics (“reform time”) in a bridgewire igniter, but there is no electrical bridgewire and reform time is not an issue in the Jones reference detonating cord. Therefore, the art fails to provide a motive for making the proposed combination of the microballoons of the Driscoll reference with the detonating cord of the Jones patent. For this additional reason, the stated ground of rejection is traversed.

It should now be clear that only the Applicants have suggested adding microballoons to the pulverulent explosive material in the core of a detonating cord and have disclosed the unexpected result of such a combination. Accordingly, the stated ground of rejection is respectfully traversed.

H. Rejection of Claims 4, 6, and 7 Under 35 U.S.C. 103

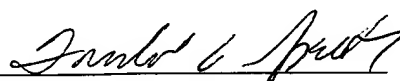
Claims 4, 6, and 7 stand rejected under 35 U.S.C. 103 as being unpatentable over the Jones reference in view of the Driscoll reference and further in view of the Takeuchi reference.

The rejected claims are allowable at least because they depend from a base claim that is allowable for reasons set forth above (section G). Furthermore, the teaching of the Takeuchi reference relates to the use of microballoons in slurry explosives, cast boosters and other explosive devices, but not in not including detonating cord (the Jones reference) or deflagrating ignition materials (the Driscoll reference) and there is no teaching in the art to support an expectation that the utility of the microballoons disclosed in the Takeuchi reference would also be exhibited in detonating cord or in a deflagrating ignition material. In addition, as noted above (section E), the Takeuchi reference teaches away from using quantities of microballoons that reduce detonation velocity, and so teach away from the invention. Accordingly, the stated ground of rejection is respectfully traversed.

Each of the stated grounds of rejection have been addressed or traversed. Reexamination and reconsideration of the pending claims, and reinstatement of the claims withdrawn from consideration, are respectfully requested.

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